Hypersensitivity reaction to dimethyl sulfoxide (DMSO)

ID: 1832 v.4 **Endorsed**

⚠ Safety alert
Anaphylaxis and severe infusion reactions are life threatening emergencies. Any delay in the recognition of the initial signs and symptoms can result in a fatal outcome either because of airway obstruction or vascular collapse.

Background

Definition

Allergic reactions may occur infusion of thawed haemopoietic stem cells (HSC). Reactions can include a wide variety of symptoms and serious hypersensitivity reactions, including anaphylaxis, have been reported.

Transfusion complications may occur due to the additive solution and/or other factors related to storage. Dimethyl sulfoxide (DMSO) is a solvent used as a cryoprotectant for HSC which is quickly distributed to all the tissues after the administration of the stem cells. Anaphylactoid symptoms after DMSO administration are generally mild to moderate and rarely life threatening.[1]

Onset/duration

Both anaphylaxis and infusion related reactions usually occur during, or within a few hours of the DMSO infusion. General side effects such as nausea, vomiting and abdominal cramps are seen in up to 50% of patients and are believed to arise due to vagal response caused by the intravenous infusion of a cold liquid.[2]

Assessment

Signs and symptoms

- nausea and vomiting
- bradycardia
- back and/or abdominal pain
- headache
- skin rash
- tightness in the throat
- alterations of heart rate and blood pressure
- dyspnoea and/or hypoxia
- chest pain/discomfort
- dizziness and/or seizures
- flushing and/or itching of the skin.

The vast majority of cardiac side effects are self-limiting and are not usually associated with serious morbidity and mortality.

Investigations and diagnosis

Both anaphylaxis and infusion reactions are serious and patients should be closely monitored.

Perform baseline:

- blood pressure
- temperature
- pulse
- oxygen saturation.

Repeat these observations every 15 minutes during HSC infusion.
Following the infusion, temperature, pulse, blood pressure and oxygen saturation should be monitored every two (2) hours for the next 6 hours and then four (4) hourly for the next 24 hours.

The staff member responsible for the infusion of HSC product must remain at the patient's bedside until the procedure is completed.

Grading

Grade	Allergic reaction
1	Systemic intervention not indicated
2	Oral intervention indicated
3	Bronchospasm; hospitalisation indicated for clinical sequelae; intravenous intervention indicated
4	Life-threatening consequences; urgent intervention indicated
5	Death

Common Terminology Criteria for Adverse Events (CTCAE) v5.0, November 27, 2017

Grade	Anaphylaxis
1	-
2	-
3	Symptomatic bronchospasm, with or without urticaria; parenteral intervention indicated; allergy related oedema/angioedema; hypotension
4	Life-threatening consequences; urgent intervention indicated
5	Death

Common Terminology Criteria for Adverse Events (CTCAE) v5.0, November 27, 2017

While use of these separate grading scales may be useful for classifying the nature of an infusion reaction for research purposes, they are less useful for clinical care, since it may not be obvious if the patient is having an infusion reaction or an allergic reaction.

Management

Prevention

Premedication (e.g. antihistamines, corticosteroids etc.) can help prevent and/or reduce the severity of infusion reactions and although premedication can reduce the severity of an allergic reaction, it does not prevent anaphylaxis. Refer to individual protocols for premedication regimen. Many reactions are related to the amount of DMSO received, as such, the amount of DMSO administered should be minimised. The current recommendation is no more than 1mg/kg/day to be administered.[3]

Treatment

Exclude other causes that may not be related to this treatment.

Infusion reactions (grade 1 or 2) with no symptoms of anaphylaxis:

- stop the infusion
- maintain CVC patency
- notify medical officer and scientist immediately
- administer medications and fluid as prescribed
- do not discard any equipment with remaining product
- symptom management.

Infusion reactions (grade 3 or 4) and anaphylaxis:

- stop infusion
- urgent medical review
- symptom management
- initial management should be guided by the **DRSABCD** (Danger, Response, Send for help, Airway, Breathing, Compression-CPR, Defibrillation) **of resuscitation**
- **call a Medical Emergency per local guidelines.**

Patient education

Educate patient:

- about the potential risk of a hypersensitivity reaction (HSR)
- to report any of the following symptoms:
  - dyspnoea
  - flushing
  - rash
  - difficulty swallowing
  - feeling hot
  - nausea
  - abdominal pain.

References

1 Treleaven, JG and AJ Barrett. 2009. "Hematopoietic stem cell transplantation in clinical practice. Churchill Livingstone." Elsevier, Edinburgh, London, New York, Oxford, Philadelphia, St. Louis, Sydney, Toronto.

2 Windrum, P., T. C. Morris, M. B. Drake, et al. 2005. "Variation in dimethyl sulfoxide use in stem cell transplantation: a survey of EBMT centres." Bone Marrow Transplant 36(7):601-603.

3 Otrock, Z. K., D. S. Sempek, S. Carey, et al. 2017. "Adverse events of cryopreserved hematopoietic stem cell infusions in adults: a single-center observational study." Transfusion 57(6):1522-1526.

History

Version 4

Date	Summary of changes
31/07/2020	Reviewed with the following changes: • Haempoietic progenitor cells (HPC) terminology changed to haemopoietic stem cells (HSC) • Maximum dosing recommendations • Changed to Version 4.

Version 3

Date	Summary of changes
18/04/2012	First approved on eviQ. Version 1.
30/06/2015	Reviewed and reformatted. Version 2.
31/05/2017	Transferred to new eviQ website. Version 3.
24/04/2018	CTCAE information updated to v5.0 published November 27, 2017.

First approved: 18 April 2012
Last reviewed: 31 July 2020
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https://www.eviq.org.au/p/1832
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